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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/077,633	02/15/2002	Thomas G. Thundat	920976.90172	5479
47698	7590	07/27/2005		
MCDONNELL BOEHNEN HULBERT & BERGHOFF LLP 300 S. WACKER DRIVE 32nd FLOOR CHICAGO, IL 60606			EXAMINER	NOGUEROLA, ALEXANDER STEPHAN
			ART UNIT	PAPER NUMBER
			1753	

DATE MAILED: 07/27/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/077,633	THUNDAT ET AL.	
Examiner	Art Unit		
ALEX NOGUEROLA	1753		

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).

Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1) Responsive to communication(s) filed on 15 July 2005.

2a) This action is **FINAL**. 2b) This action is non-final.

3) Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4) Claim(s) 24-58 is/are pending in the application.
4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5) Claim(s) 43-56 is/are allowed.

6) Claim(s) 24-40, 57 and 58 is/are rejected.

7) Claim(s) 41 and 42 is/are objected to.

8) Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9) The specification is objected to by the Examiner.

10) The drawing(s) filed on 03 November 2004 is/are: a) accepted or b) objected to by the Examiner.

 Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

 Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11) The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12) Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
a) All b) Some * c) None of:
1. Certified copies of the priority documents have been received.
2. Certified copies of the priority documents have been received in Application No. _____.
3. Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) Notice of References Cited (PTO-892)
2) Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____

4) Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ .
5) Notice of Informal Patent Application (PTO-152)
6) Other: _____

DETAILED ACTION

Response to Amendment

1. Applicants' amendment of July 15, 2005 does not render the application allowable.

Status of Rejections pending since the Office action of January 24, 2005

2. All previous rejections are withdrawn.

Claim Rejections - 35 USC § 102

3. The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.
4. Claims 24-40, 57, and 58 are rejected under 35 U.S.C. 102(b) as being anticipated by Gurtner et al. ("Photoelectrophoretic transport and Hybridization of DNA

Oligonucleotides on Unpatterned Silicon Substrates," *Journal of the American Chemical Society*, volume 122, number 36, September 13, 2000) ("Gurtner").

Addressing claim 24, Gurtner discloses an apparatus for separating molecules (abstract), said apparatus comprising:

a semiconductor material layer (Mn_2O_3 modified silicon layer in Figure 1);
a counter electrode (Pt auxiliary electrode);
an electrically conductive layer (electrolyte) located between and in contact with the semiconductor and in contact with the counter electrode, the electrically conductive layer further including at least two different molecules that are separable by the apparatus (see the last paragraph in the second column on page 8593, bridging to page 8594, Table 2, and Figure 5, which discloses capturing two different oligonucleotides with two different capture probes);
a voltage source electrically coupled to the semiconductor and the counter electrode wherein the voltage source applies a voltage potential across the electrically conductive layer to thereby generate a depletion region in the semiconductor (implied by the caption to Figure 1, for example, which states, "In presence of applied potential, these electron holes generate a photoelectrochemical current that causes ...[emphasis added]"); and
at least one photon energy source incident upon the semiconductor having the depletion region wherein the photon energy source generates photon energy sufficient to form electron hole pairs that are separated by the voltage potential depletion region thereby generating a photopotential at the surface of the

semiconductor material causing charged molecules in the electrically conductive layer medium in contact with the semiconductor material to move in response to the localized voltage (Figure1 and its caption), wherein at least one of the photon energy source and the semiconductor is movable relative to the other (Experimental Setup (Figure 1) in second column on page 8590, "Sample illumination ... was accomplished by a single-mode optical fiber .. mounted on a motorized micromanipulator stage ...").

Gurtner does not mention providing at least two different molecules that are separable by the apparatus. However, it would have been obvious to do so because Gurtner's device is an assay device configured for photoelectrophoretically transporting oligonucleotides to nucleic acid capture strands and detecting oligonucleotides that are captured by the capture strands. See the abstract. Gartner discloses detecting two different oligonucleotides with different capture strands. Although Gurtner only apparently tested the device with different solutions of a known single oligonucleotide (Assay Procedure), clearly one would not use Gurtner's device only with known oligonucleotides. The device is for detecting whether unknown oligonucleotides of interest are present in the sample solution.

Addressing claim 25, Gurtner discloses at least Si as a semiconductor material. See Figure 1.

Addressing claim 26, in Gurtner the electrically conductive layer is a fluid film (note paragraph [0030] in Applicants' specification).

Addressing claim 27, note the agarose shown in Figure 1.

Addressing claims 28, 35, and 40, for the limitations of these claims see Figure 1.

Addressing claims 29-34, for the limitation of these claims see Experimental Setup (Figure 1) in the second column on page 8590. For claim 31 note the filter wheel. For claims 31-33 note that these claims only provide intended use limitations that unless shown otherwise do not *structurally* modify the claimed apparatus.

Addressing claims 36 and 38, note that these claims only provides an intended use limitation that unless shown otherwise does not *structurally* modify the claimed apparatus.

Addressing claim 37, an artificial pattern may be seen in Figures 4 and 5.

Addressing claim 39, the electrodes of Gurtner are optically transmissive since current is generated by exposing the electrodes to light. See Figure 1.

Addressing claim 57, Gurtner discloses an apparatus for separating molecules (abstract), said apparatus comprising:

a semiconductor material layer (Mn₂O₃ modified silicon layer in Figure 1);
a counter electrode (Pt auxiliary electrode);
an electrically conductive layer (electrolyte) located between and in contact with the semiconductor and the counter electrode, the electrically conductive layer further including at least two different molecules wherein the different molecules differ by at least size and mass ((T1, T2) - Table 2; Figure 5 and the last paragraph in the second column on page 8593, bridging to page 8594);
an interface located between the semiconductor material layer and the electrically conductive layer (agarose layer);
a voltage source electrically coupled to the semiconductor and the counter electrode wherein the voltage source applies a voltage potential across the interface to thereby generate a depletion region in the semiconductor (implied by the caption to Figure 1, for example, which states, "In presence of *applied potential*, these *electron holes* generate a photoelectrochemical current that causes ...[emphasis added]"); and
at least one photon energy source incident upon the semiconductor having the depletion region wherein the photon energy source generates photon energy sufficient to form electron hole pairs that are separated by the voltage potential depletion region thereby generating a photopotential at the surface of the semiconductor material causing charged molecules in the electrolyte medium in

contact with the semiconductor material to move in response to the localized voltage (Figure1 and its caption), wherein at least one of the photon energy source and the semiconductor is movable relative to the other (Experimental Setup (Figure 1) in second column on page 8590, "Sample illumination ... was accomplished by a single-mode optical fiber ... mounted on a motorized micromanipulator stage ...").

Addressing claim 58, the at least two different molecules are oligonucleotides.

See Table 2.

Allowable Subject Matter

5. Claims 43-56 are allowed.

6. Claims 41, 42 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

7. The following is a statement of reasons for the indication of allowable subject matter:

- a) Claim 41 requires the counter electrode to be indium doped tin oxide. In Gurtner the counter electrode is a platinum electrode. See Figure 1 and Experimental Setup.
- b) Claim 42 requires the counter electrode to be a transparent insulating material having at least one surface coated by a film of conductive material. In Gurtner the counter electrode is a circular platinum electrode. See Figure 1 and Experimental Setup.
- c) Claim 43: the combination of limitations requires the counter electrode insulating material to be "selected from the group of materials consisting of glass and quartz". In Kakutani the insulating material is made from polyethylene terephthalate. See col. 5:29-33. In Gurtner the counter electrode is a circular platinum electrode, not a film of conductive material on a transparent insulating material. See Figure 1 and Experimental Setup.
- d) Claim 44 requires "inducing the migration of the charged analyte molecules wherein at least two of the plurality of different charged analyte molecules migrate at afferent rates to effectuate molecules separation. In Gurtner different

charged analyte molecules are separated by being captured by selective capture probes, not by differential migration.

e) Claims 45, 46, 48-56 depend directly or indirectly from allowable claim 44.

f) Claim 47: the combination of limitations requires the electrically conductive layer to contain an admixture of a plurality of different charged analyte molecules of interest and to be a film comprising "an admixture of a composition selected from the group consisting of polyacrylamide, dextran, polymethyl methacrylate and agarose and the at least two different molecules that are bang separated by the apparatus." In Kakutani the film comprises an admixture of various types of toner molecules and an insulating solvent, such as kerosene. See col. 5:49-55. In Gurtner the electrically conductive layer is electrolyte solution. Gurtner does disclose an agarose film above the electrodes and in contact with eh electrolyte solution (Figure 1). However, the analytes do not enter this film. Some analytes are captured by the capture probes attached to the top of the film, the others stay in solution.

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8. Any inquiry concerning this communication or earlier communications from the examiner should be directed to ALEX NOGUEROLA whose telephone number is (571) 272-1343. The examiner can normally be reached on M-F 8:30 - 5:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, NAM NGUYEN can be reached on (571) 272-1342. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Alex Noguerola

Alex Noguerola
Primary Examiner
AU 1753
July 25, 2005